

CLAIMS

1. Apparatus for the transmission and the reception of data comprising:
 a plurality of inputs and a plurality of corresponding outputs for the respective coupling to the incoming part and outgoing part of a plurality of links, wherein, to each input and to each output, is associated a respective switching device (14₁, 14₂, 14₃, 14₄),
 5 for each couple of input and output, an active terminating board (12₁) for coupling this input and this output and for further transmitting data,
 at least one spare terminating board (12₂) which is able to replace a defective active terminating board,
 10 each terminating board comprising means (20₁) adapted to test the quality of the link (W) to which it is associated and to compare said quality to a predetermined criterium and to generate a control signal to first control means (26₁, 28₁) of said each terminating board, the first control means being adapted to replace the defective link by another link, if this quality does not comply with the predetermined criterium, and
 15 second control means (26₁, 41) coupled to the active and spare terminating boards adapted to modify the operation of at least one of said switching devices such that in case of failure of an active terminating board, it is replaced by the spare terminating board.
 20
2. Apparatus according to claim 1, wherein each switching device comprises a 2 x 2 switch.
3. Apparatus according to claim 1 or 2, wherein the switching device associated to an input and the switching device associated to the corresponding output
 25 are coupled to each other and wherein the spare terminating board comprises a device (20₂, 28₂) adapted to test the continuity of the coupling of these switching devices to this terminating board.
4. Apparatus according to claims 2 and 3 wherein one terminal (16₁) of each 2x2 switch is coupled to the corresponding input or output, two other terminals (16₃, 16₄) are coupled to the terminating boards and the last terminal (16₂) is used for coupling to another 2x2 switch.
 30
5. Apparatus according to any of the previous claims wherein the switching devices are of the optical type.
6. Apparatus according to any of the previous claims wherein the switching devices and their control means are all installed on a same applique panel (42), the terminating boards are all installed on the same terminating panel
 35

- (46) and the coupling between the switching devices and the terminating boards are realized on a back panel (44).
7. Apparatus according to any of the previous claims wherein one spare terminating board (80) is provided for at least two active terminating boards (82, 84, 86) and the switching devices (14₁, 14₂, 14₃; 14'₁, 14'₂, 14'₃) for the inputs and outputs of the links are connected in series towards the spare terminating board.
- 5 8. Apparatus according to claim 7 wherein the second control means (26₁, 41) for the switching devices establish a priority among the active terminating boards when at least two active terminating boards present a failure.
- 10 9. Apparatus according to any of the previous claims wherein, in case of failure of an active terminating board, the second control means (26₁, 41) of the switching devices are such that this failed active terminating board is connected as a spare terminating board.
- 15 10. Apparatus according to claim 9 wherein, after replacement of a failed terminating board, the switching devices are connected to allow the control of the correct operation of the replaced terminating board.
- 20 11. Apparatus according to any of the previous claims wherein all links are adapted to carry data with different priorities and wherein the second control means (41) are further adapted to decide, in case of link failure and/or terminating board failure, that the link carrying the data having a highest priority will take over.
- 25 12. A method for controlling the operation of an apparatus for the transmission and reception of data, said apparatus comprising:
 a plurality of inputs and a plurality of corresponding outputs for the respective coupling to the incoming part and outgoing part of a plurality of links,
 for each couple of input and output, an active terminating board for coupling this input and this output and for further transmitting data,
- 30 35 at least one spare terminating board which is able to replace a defective active terminating board,
 each terminating board comprising means (20₁) adapted to test the quality of the link (W) to which it is associated and to compare said quality to a predetermined criterium and to generate a control signal to first control means (26₁, 28₁) of said each terminating board, the first control means

being adapted to replace the defective link by another link, if this quality does not comply with the predetermined criterium, and

second control means (26₁, 41) coupled to the active and spare terminating boards for controlling the replacement of an active terminating board in case of failure of the latter, by a spare terminating board,

wherein said method comprises the step of providing a switching device for each input and each output, and a step of controlling the switching devices with the second control means for modifying their operations and couplings in such a way that they realize the replacement of a failed active terminating board by a spare terminating board.

- 5 10 15 20 25 30 35
- 13. A method according to claim 12, comprising the step of providing each switching device with a 2 x 2 switch.
 - 14. A method according to claim 12 or 13, comprising the step of coupling to each other the switching device associated to an input and the switching device associated to the corresponding output and the step of testing the continuity of the coupling of this switching device to this terminating board.
 - 15. A method according to claims 13 and 14, comprising the step of coupling one terminal (16₁) of each 2x2 switch to the corresponding input or output, coupling two other terminals (16₃, 16₄) to the terminating boards and using the last terminal (16₂) for coupling to another 2x2 switch.
 - 16. A method according to any of claims 12-15, comprising the step of installing the switching devices and their control means on a same applique panel (42), the step of installing all terminating boards on the same terminating panel (46) and the step of realizing the coupling between the switching devices and the terminating boards on a back panel (44).
 - 17. A method according to any of claims 12-16, comprising the step of providing one spare terminating board (80) for at least two active terminating boards (82, 84, 86) and the step of connecting in series the switching devices (14₁, 14₂, 14₃; 14'₁, 14'₂, 14'₃) for the inputs and outputs of the links towards the spare terminating board.
 - 18. A method according to claim 17, wherein the second control means (26₁, 41) for the switching devices establish a priority among the active terminating boards when at least two active terminating boards present a failure.
 - 19. A method according to any of claims 12-18 wherein, in case of failure of an active terminating board, the switching devices are controlled in such a way

that this failed active terminating board is connected as a spare terminating board.

20. A method according to claim 19 wherein, after replacement of a failed terminating board, the switching devices are connected to allow the control of the correct operation of the replaced terminating board.
- 5 21. A method according to any of claims 14-22, wherein all links are used for carrying data with different priorities and wherein, in case of a link failure and/or a terminating board failure, the link carrying the data having a highest priority will take over.